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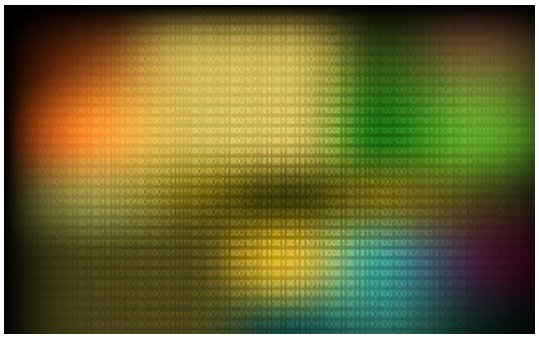

RESEARCH REPORT

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EXECUTIVE SUMMARY

Smart Augmented Reality Glasses

Head-Up Displays, Mixed Reality Holographic Displays, and Smart Helmets for Consumer, Enterprise, Industrial, Sports, Healthcare, and Public Safety Applications: Market Analysis and Forecasts

Published 2Q 2015

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SECTION 1

EXECUTIVE SUMMARY

1.1 INTRODUCTION

The smart augmented reality (AR) glasses market is a combination of different technologies, from simple head-up displays (HUDs) like Google Glass that act as a second screen, readily accessible with a glance, displaying text or images, to more complex holographic display technologies like the Microsoft HoloLens or Magic Leap that provide immersive and tangible experiences. While many would consider the Magic Leap and HoloLens in a different league from Google Glass, in essence, all of them provide an AR experience, layering elements in a user's field of view (FOV), on top of the real world.

The market is currently undergoing a transition, since Google decided to go back to the drawing board, redesigning Google Glass, although the original Glass product is still seeing adoption in industrial settings through the Glass at Work program. In the meantime, other vendors, including Vuzix, Epson, and Sony, have ramped up their activity, releasing second- or third-generation HUD-type smart AR glasses products. Others such as Meta, Atheer Labs, and DAQRI are trying to stretch the boundaries of AR by providing 3D or 4D features. Most of these products are being rolled out in small pilots and trials for industrial use cases, including warehouses, manufacturing shop floors, and mobile workforce management. At the same time, a small Canadian company, Recon Instruments, has successfully shipped the largest number of smart AR glasses to date, targeting high-intensity sports activities like skiing, snowboarding, cycling, and running.

The two products that have the most promise and are poised to revolutionize this market have yet to become commercially available. These include the Microsoft HoloLens and Magic Leap's elusive and yet to be announced product. These define a new type of smart glasses experience, allowing users to be in the real world, but at the same time, be immersed in an artificial holographic reality that feels almost real and tangible. We have only seen glimpses of these technologies; more so the HoloLens than Magic Leap, but both are set to become the standard for smart AR glasses technology and will possibly redefine it once they become public. Another reason why these technologies are likely to succeed and be adopted far beyond any other smart AR glasses product is that, in their true sense, they are mass-consumer products. While initial adoption will occur in the enterprise, the most formidable challenge for the industry will be convincing mainstream consumers to invest in this immersive and potentially disruptive next-generation computing platform.

This report covers the various types of smart AR glasses products, from simple HUDs to mixed reality (MR) holographic displays and smart helmets. The different application markets for smart AR glasses that are covered in depth include consumer, enterprise, industrial, public safety, and healthcare. The study includes competitive analysis of the various hardware and software vendors, along with strategic recommendations for players in the value chain. Market forecasts are included for the period from 2013 to 2020, with unit shipment and revenue data segmented by region, application market, and connectivity technology.

1.2 MARKET DRIVERS

Smart glasses provide an ideal user interface (UI) for hands-free operation, with the device at eye level, presenting information when needed. Voice, touch, or head gestures can control

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the smart glasses, removing the need for hands, which is one of the main reasons devices like Google Glass and others continue to see adoption in the industrial workplace.

Smart glasses provide ideal hands-free operation when using a camera, in addition to providing a first-person wide-angle view of what the person is seeing. Smart glasses could replace the phone, with the ability to make and receive audio or video calls. For the first time, workers on the shop floor or in the field can provide their colleagues and managers a first-person view of what they are seeing. This can help in specific situations where they need assistance, or they are giving instructions or training.

In an industrial setting, the workflow is an important element in how shop floors manage and measure efficiency, impacting the cost and delivery of the product or service. Workflow efficiency is highly dependent on workers being able to multitask their way around the shop floor, as they manage different input, capture, and guidance mechanisms. Smart glasses are input devices that can hold manuals and diagrams, and capture video and photo at the same time.

Smart AR glasses provide a degree of freedom in terms of the size of the screen and the 3D capabilities that one can achieve, especially when using holographic technology like the Microsoft HoloLens. The living room essentially becomes the screen, with content breaking out from the shackles of a 2D screen and existing in real space. With air tap gestures, users can control these holographic objects, adding a much broader degree of freedom compared to using a mouse or finger zoom on a flat screen.

While modern families are experiencing some form of disengagement at home, due to smartphone, tablet, and laptop screens being always on, there is a chance that a socially engaging technology like the HoloLens could bring families together. Rather than having each member of the family escape into his or her own holographic world, Microsoft has designed holograms to be shared between multiple users. This means a family can interact with a game or object together, creating a different kind of technology-based social interaction that encourages participation, rather than isolation. Holographic computing could turn living rooms into virtual teleportation hubs, with holographic extensions of friends and family visiting our living rooms through Skype. There is immense potential for smart AR glasses technology in the consumer space, especially in the home where entertainment, communication, and gaming experiences could be transformed.

Just as the HoloLens is trying to reshape entertainment in the living room, another smart AR glasses technology from Magic Leap is poised to bring enhanced experiences not just indoors, but outdoors as well, whether it is the sidewalk, park, public square, or the beach. Magic Leap could transform storytelling and movies, and how we view entertainment. The real world essentially becomes the setting and we decide our own characters and storylines. Magic Leap presents a brand new canvas for moviemakers, animators, and game creators, and is an area worth watching once this technology is released and makes advances over time.

1.3 Market Barriers

Design and social acceptability is a key factor for consumer-facing smart glasses. Google Glass has had issues with social acceptability, with many public spaces and even workplaces banning the device. Glass is a highly visible device that sits on the user's face, and looks strange and invasive to many. Those banning Google Glass feared it could be used to secretly capture video or images. As a result of this and other challenges, Google has closed the Glass Explorer program and is in the process of having the Nest team redesign the headset from scratch. Social acceptability is not a big concern for enterprise

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and industrial applications, as it is used in a controlled enterprise setting for a specific task at hand. However, in customer-facing use cases, such as retail, hotels, and transportation, there is the risk that customers are put off by the sight of Google Glass or any other smart glasses device that looks different from a normal pair of glasses.

Increasing automation of industrial processes could impact primary use cases for smart AR glasses. Most modern industrial operations are already automated, with the need for a manual workforce reducing. Key application areas for smart glasses include manufacturing, warehousing, and remote workforce management, all of which could foresee some kind of automation and doing away with the manual workforce at some point. So, while smart glasses equip humans with machine-like capabilities, in some ways turning humans into part cyborg, there is a possibility that the tasks that humans are being asked to perform with smart AR glasses will be fully automated and handed over to machines at some point.

1.4 KEY APPLICATIONS

The various application markets and use cases for smart AR glasses include consumer, enterprise, industrial, public safety, healthcare, sports, and others. Tractica defines each application market as follows:

- **Consumer**: General user of the smart AR glasses device for personal use with the smart AR glasses device being owned and purchased by or for the user. The primary use of the smart AR glasses is personal, but in some instances, it could also be taken into the workplace just like a smartphone.
- **Enterprise**: Smart AR glasses used in an enterprise or workplace setting include smart AR glasses used as a desktop replacement or desktop-complementary device, handling general computing applications, such as word processing, email, videos, image processing, and other tasks. Enterprise also includes product design, engineering design services, architecture and construction firms, and retail consumer-facing applications.
- **Industrial**: Smart AR glasses used in a manufacturing or industrial setting include oil and gas, mining, aerospace, warehouse, transport/logistics, etc. The smart AR glasses device is supplied by the company with customized software applications related to specific workplace tasks.
- **Public Safety**: Smart AR glasses used in a law enforcement or public safety setting, including police, fire, emergency or other professional security services. The smart AR glasses device is supplied by the company with customized software applications related to specific workplace tasks.
- **Healthcare**: Smart AR glasses used specifically for professional healthcare purposes in a medical setting like a clinic or hospital. Devices used by doctors, nurses, or other healthcare staff for purposes of optimizing data entry for electronic health records, patient checkups, surgery, and other medical conditions. This also includes smart AR glasses used for medical, educational, and training purposes.
- **Sports**: Smart AR glasses used by amateur, professional, or semi-professional athletes for training, exercising, or during a sports event. Smart AR glasses used in cycling, running, alpine sports, or any other sport high-intensity activity fall under this category.
- **Others**: The others category of applications includes military or defense smart AR glasses and general university or school education uses.

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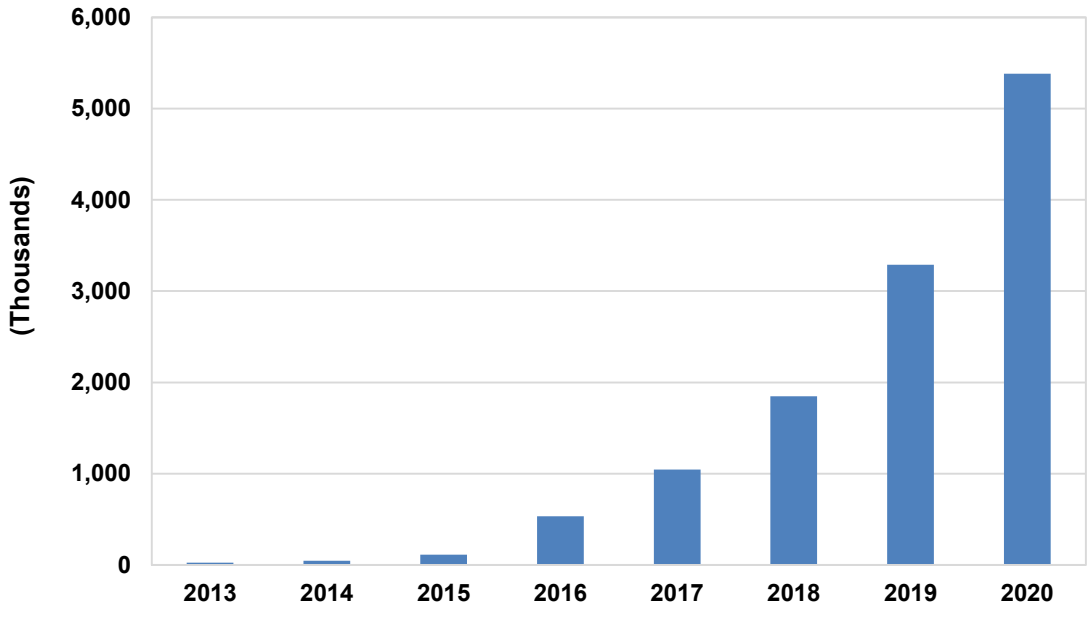
1.5 MARKET FORECASTS

Tractica forecasts that the global market for smart AR glasses will grow from 26,000 unit shipments in 2013 to 5.3 million unit shipments by 2020, representing a compound annual growth rate (CAGR) of 115%.

Chart 1.1 Smart AR Glasses Shipments, World Markets: 2013-2020



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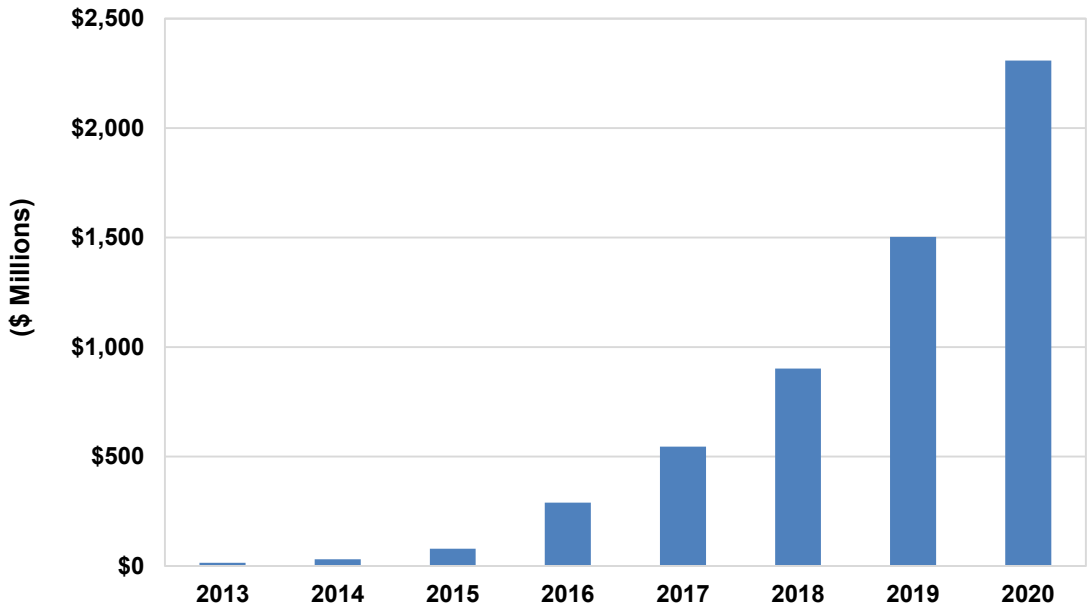
This will yield market device revenue that is expected to grow from $15.2 million in 2013 to $2.3 billion by 2020, at a CAGR of 105% during the forecast period.

Chart 1.2 Smart AR Glasses Device Revenue, World Markets: 2013-2020



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SECTION 10

SCOPE OF STUDY

This report covers the various types of smart AR glasses products, from simple HUDs to MR holographic displays and smart helmets. The different application markets for smart AR glasses that are covered in depth include consumer, enterprise, industrial, public safety, and healthcare. The study includes competitive analysis of the various hardware and software vendors, along with strategic recommendations for players in the value chain. Market forecasts are included for the period from 2013 to 2020, with unit shipment and revenue data segmented by region, application market, and connectivity technology.

SOURCES AND METHODOLOGY

Tractica is an independent market research firm that provides industry participants and stakeholders with an objective, unbiased view of market dynamics and business opportunities within its coverage areas. The firm's industry analysts are dedicated to presenting clear and actionable analysis to support business planning initiatives and go-to-market strategies, utilizing rigorous market research methodologies and without regard for technology hype or special interests including Tractica's own client relationships. Within its market analysis, Tractica strives to offer conclusions and recommendations that reflect the most likely path of industry development, even when those views may be contrarian.

The basis of Tractica's analysis is primary research collected from a variety of sources including industry interviews, vendor briefings, product demonstrations, and quantitative and qualitative market research focused on consumer and business end-users. Industry analysts conduct interviews with representative groups of executives, technology practitioners, sales and marketing professionals, industry association personnel, government representatives, investors, consultants, and other industry stakeholders. Analysts are diligent in pursuing interviews with representatives from every part of the value chain in an effort to gain a comprehensive view of current market activity and future plans. Within the firm's surveys and focus groups, respondent samples are carefully selected to ensure that they provide the most accurate possible view of demand dynamics within consumer and business markets, utilizing balanced and representative samples where appropriate and careful screening and qualification criteria in cases where the research topic requires a more targeted group of respondents.

Tractica's primary research is supplemented by the review and analysis of all secondary information available on the topic being studied, including company news and financial information, technology specifications, product attributes, government and economic data, industry reports and databases from third-party sources, case studies, and reference customers. As applicable, all secondary research sources are appropriately cited within the firm's publications.

All of Tractica's research reports and other publications are carefully reviewed and scrutinized by the firm's senior management team in an effort to ensure that research methodology is sound, all information provided is accurate, analyst assumptions are carefully documented, and conclusions are well-supported by facts. Tractica is highly responsive to feedback from industry participants and, in the event errors in the firm's research are identified and verified, such errors are corrected promptly.

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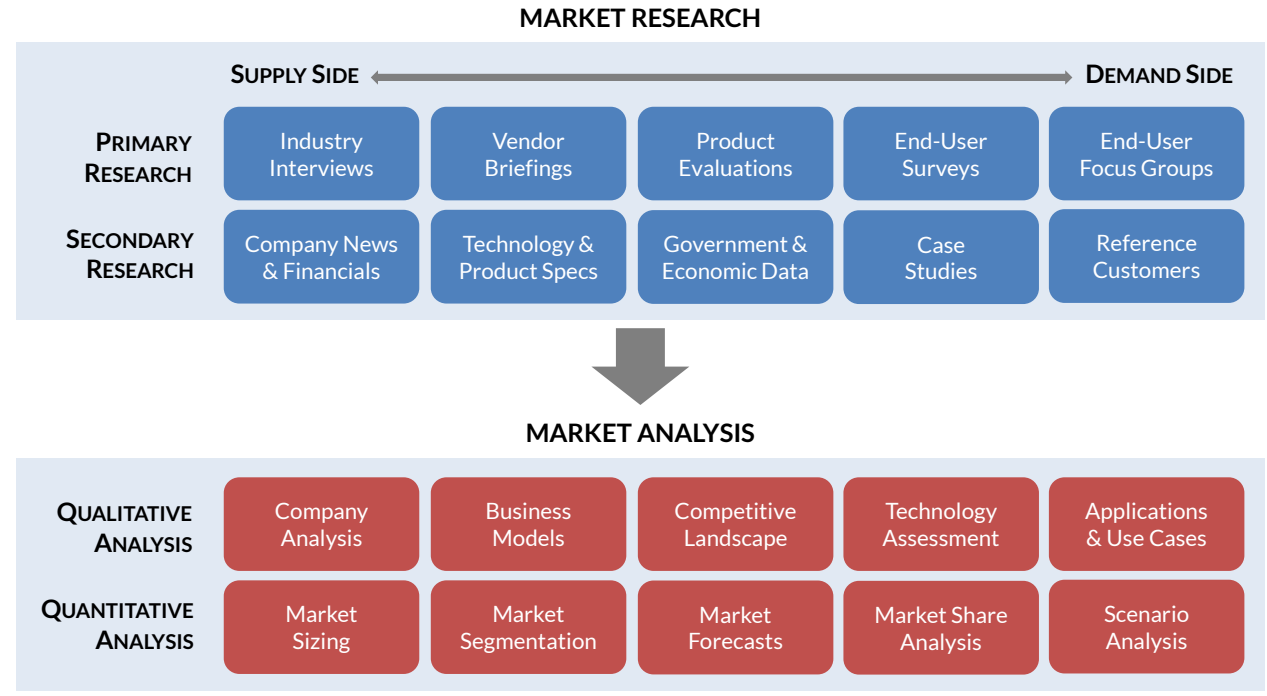
Chart 10.1 Tractica Research Methodology



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NOTES

CAGR refers to compound annual growth rate, using the formula:

CAGR = (End Year Value ÷ Start Year Value)$^{(1/steps)}$ – 1.

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2015 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

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